

2017-2018

GEORGIA STATE UNIVERSITY  
DEPARTMENT OF BIOLOGY

## **POLICY DOCUMENT FOR THE DOCTORAL PROGRAM FOR ADVANCED STUDIES IN BIOLOGICAL SCIENCES**

The Department of Biology offers courses of study leading to the Ph.D. in the following core disciplines:

**Applied & Environmental Microbiology  
Cellular and Molecular Biology & Physiology  
Molecular Genetics & Biochemistry  
Neurobiology & Behavior**

Students should select the core discipline that best represents their research interests as their major area of specialization. Subsequent changes in core discipline may be made with the consent of a committee of Area Program Directors.

### **I. ADMISSION REQUIREMENTS**

- A. Applicants must have a baccalaureate or master's degree in biology or a related field.
- B. Applicants must submit transcripts of their past academic performance, scores on the Graduate Record Examination, and three letters of reference.
- C. Applicants must submit a statement of their academic interests and goals.
- D. In addition to meeting the regular admission requirements, international applicants must demonstrate proficiency in English. This may be done by taking the TOEFL or IELTS tests.

### **II. ADMISSION PROCEDURES**

- A. Applications may be downloaded from [http://www.cas.gsu.edu/grad\\_admission.html](http://www.cas.gsu.edu/grad_admission.html).

We accept applications for any semester up to one month prior to the beginning of the semester (10 weeks for international students). However, to ensure consideration for a graduate assistantship applicants should submit all materials by **December 6**.

B. All completed application materials should be returned directly to:

**For U.S. Postal Service Delivery:**

Georgia State University  
College of Arts & Sciences  
Office of Graduate Studies  
P.O. Box 3993  
Atlanta, GA 30302-3993

**For Overnight Carrier, UPS, FedEx, DHL, etc:**

Georgia State University  
College of Arts & Sciences  
Office of Graduate Studies  
75 Poplar Street, Suite 800  
Atlanta, GA 30303

III. STUDENT SUPPORT

Teaching and research assistantships are available and individual faculty members often support students working on specific research programs with outside funds from research grants. Students requiring financial aid are strongly urged to submit their applications by the priority deadline listed above. All funded Ph.D. students are required to demonstrate proficiency in instruction during their doctoral studies through service as teaching assistants (5 sections plus one apprenticeship section over the first four years). Teaching and research assistantships are considered for renewal on an annual basis.

Outstanding Ph.D. candidates are eligible to receive special funding from one of our prestigious fellowships. The fellowships, Brain and Behavior Program or the Molecular Basis of Disease Program will be awarded to those who have excelled in academia as well as research. Continued support from the fellowship is contingent upon the student's satisfactory progress in the program.

IV. ADVISEMENT

Each discipline is administered by an Area Program Director who advises students and monitors their progress throughout the program. Area Program Directors are listed in Appendix I. Students are expected to conduct at least two 10-week research rotations during their first academic year (exceptions require the written approval of the Area Program Director). Incoming students are encouraged to contact their Area Program Director before the beginning of their first semester to arrange a rotation schedule. Subsequent changes in the rotation schedule can be made by mutual consent of the student, the Area Program Director, and faculty members involved in the rotations. All incoming students are required to meet with their Area Program Director to choose an **Advisory Committee**. The purpose of the committee is to provide academic advice in the area of courses and lab rotation choices. The committee will meet with the student at least once a year **until** the qualifying exam. By the end of the first year, students will choose a dissertation advisor who will serve as their primary mentor for the remainder of their doctoral program. After the successful completion of the qualifying exam, the student will then select his/her dissertation committee.

Once a dissertation committee has been selected and approved, each student is required to have an annual meeting with their dissertation committee by the end of November. This is a minimum requirement and failure to meet will result in a grade of "U" for research and a decrease in their assistantship.

## V. REQUIREMENTS FOR THE DEGREE

The Doctor of Philosophy (Ph.D.) is conferred upon the student only for distinguished work and original scholarship. Completion of the specified coursework and passage of required examinations are essential, but the degree can only be given when the student has presented a dissertation judged to be a significant contribution to the advancement of science.

### A Coursework Requirements.

A minimum of 90 hours of graduate credit is required. To satisfy the requirements for the degree, the student must complete successfully:

1. A minimum of 33 hours of graduate classroom coursework, which must include:

Discipline-specific core courses (8 hours)

Discipline-specific electives (8 hours)

Topics, concepts and seminar courses (10 hours) which must include at least six hours of discipline-specific topics and/or concept courses

Biol 8550 (2 hours) and Biol 6801 (3 hours)

Biol 9991 or 9992 (2 hours to be taken during qualifying exam)

Requirements specific for each discipline are given in Appendix II. Course descriptions are provided in Appendix III. *All incoming Ph.D. students must take Biol 8550 in their first semester.*

2. Students are required to take a minimum of 57 semester hours of Research. This requirement can be satisfied by enrolling in Biol 8800 or Biol 9999. At least 30 hours of Biol 9999 (Dissertation Research) are required. Students may enroll in Biol 9999 only after they have chosen a research advisor and prepared a dissertation proposal that has been approved by their Dissertation Committee (Dissertation Proposal, Section IV, G). Students are required to register for Biol 6900 each time they register for 8800 and 9999. Biol 6900 **does not** count towards course requirements.

### B. Academic Performance.

Students are required to maintain a minimum overall grade point average of 3.0 (B) to remain in good standing.

1. If a student's grade point average falls below 3.0, the student will be placed on academic probation. The student must regain a 3.0 average within the next 18 credit hours of coursework to remain in the program. Receipt of two or more grades of C or lower in the core or elective courses will be grounds for dismissal from the program. Withdrawing from a core course requires permission from the Area Program Director. Withdrawing without permission is grounds for reduction of support.
2. Research performance plays a significant role in the evaluation of a student's progress. Two negative evaluations in research courses (as indicated by grades of U, or unsatisfactory, in Biol 8800 or Biol 9999) will be grounds for dismissal from the program.
3. Students have six months to prepare and submit an approved dissertation proposal once they have passed the qualifying exam. Students who fail to register for BIOL 8888 and submit the

proposal by the deadline will have their assistantship decreased to \$12,000/year until the proposal has been submitted. (See VI. Completion of Non-Thesis MS Degree).

4. Each student is expected to have at **least one** publication before graduating. Frequently, students have three to five publications.

5. All credits presented for the Ph.D. degree must have been earned within 10 years of the date of the degree.

### C. **Research Performance**

Students receiving financial support must enroll in Biol 8800 (Research) or Biol 9999 (Dissertation Research) under the sponsorship of their faculty mentor. At the end of each semester, students are required to write a summary report on their Biol 8800 or 9999 research.

Bio 8800/9999 is graded on the following basis:

S - the student's performance is deemed to be satisfactory.

U - the student's performance is deemed to be unsatisfactory

IP - the student shows progress and/or exhibits potential, but requires additional laboratory and/or literature work to demonstrate the research competence expected for the doctoral program.

First-year students enrolled in Biol 8800 receive a grade of IP. Faculty mentors are asked to evaluate the student's performance. After the end of the spring semester, the Area Program Director along with the student's advisory committee will evaluate each first-year student's written reports and faculty recommendations. The student's grade will be changed to S, U or remain IP.

### D. **Residence.**

Four semesters of residence are required, three of which must be consecutive and full-time.

A Doctor of Philosophy degree will be conferred only on a student who has a record of academic achievement for a minimum of three academic years of study beyond the baccalaureate program. Upon the recommendation of the Area Program Director and with the approval of the department Chair, up to one-half of the residence requirement may be waived on the basis of coursework completed in other programs.

### E. **Qualifying Examination.**

Students must pass a written and oral qualifying examination covering their major area.

1. Overview. The Ph.D. Qualifying Examination is normally offered once a year. Students who wish to take the Examination must submit a request in writing by completing the **Request to take the Ph.D. Qualifying Examination** form available in the Graduate Coordinator's office. The student must have received an overall grade point average of 3.0 or better in all coursework representing his/her major. The Area Program Director in consultation with the student's major professor will appoint an Examination Committee. Students are encouraged to take the Qualifying Examination by the end of their second year of study. The Examination must be undertaken within four calendar years of the student's admission to the doctoral program and must be passed at least one academic year prior to the conferral of the Ph.D. degree.

2. Orientation. Prior to starting the proposal, students must have enrolled in Biol 6801, Preparation for Ph.D. Qualifying Examination.

3. Examination Committee. Upon submission of the **Request to Take the Qualifying Examination** form, the Area Program Director will appoint an Examination Committee in consultation with the major professor. The Examination Committee shall consist of at least three members of the Biology Department Graduate Faculty, one of whom will serve as Chair.

4. Doctoral Research Proposal. Students must enroll in 9991 or 9992 in the semester in which they are taking the qualifying Exam. Note that the course number is discipline-specific (see Appendix II)

5. Format of the Qualifying Examination. The candidate is expected to develop and submit a proposal for a research project, based on the NIH or NSF proposal format. Following submission of the proposal to the Examination Committee, an examination (defined later) will be scheduled. The candidate will submit to the committee a two page pre-proposal outlining the proposed research project. Included in this pre-proposal should be the following: 1) a statement of the major issues or questions (specific aims) to be addressed in the proposal; 2) a brief background that leads to the importance and significance of the issues addressed in the proposal; 3) a brief description of experimental approaches to be used in addressing these questions (including several key references); and 4) a statement of the relationship between the research in this pre-proposal and the candidate's research topic and the research ongoing in the lab of the candidate's advisor.

The student will distribute the pre-proposal to the Examination Committee who will comment on the pre-proposal in writing. The Committee Chair will then communicate comments and recommended changes in the pre-proposal to the candidate. Frequently, recommended changes in the pre-proposal will result in the necessity on the part of the candidate to modify or resubmit the pre-proposal. Upon submission of an acceptable pre-proposal, the Committee Chair will issue a written approval of the pre-proposal. The content of the proposal should be original, in that it should not duplicate any research that has been carried out previously. The proposal should be distinct from ongoing research in the candidate's laboratory but could be the basis of a future dissertation proposal. All students must consult with their Area Program Director for discipline specific formatting policies/requirements which may differ from those outlined on page 5 (see addendum). In formulation and preparation of the pre-proposal, the written proposal, and the oral presentation of the proposal given at the oral defense, the candidate is encouraged to use multiple sources of written material (books, journals, class notes, etc.). The candidate is also encouraged to consult with departmental faculty including the major professor. Such consultations are expected to cover general approaches to the writing of proposals, rather than specific content. The student is expected to adhere to the honors spirit in accordance with the University Policy on Academic Honesty.

6. Written Proposal. The proposal should not exceed 20 pages in length (double-spaced), not including references or timetable.

## Suggested Guidelines:

- 1 page Specific Aims
- 4-6 pages Introduction and Background
- 8-13 pages Experimental Design
- Timetable
- References

The candidate will submit four copies of the completed proposal to the Examination Committee by the appropriate deadline. Members of the Examination Committee will evaluate the written proposal on the basis of its logic, clarity, creativity and originality. Depending on the discipline, there will be an additional meeting of the student with the Examination Committee before the due date of the proposal, in which the student presents the proposal and receives feedback from the Committee. For this meeting, the student submits a draft of the proposal to the Committee chair by a set deadline and meets with the Committee according to the examination schedule.

All proposals must be checked using the iPlagiarism software. A copy of the report must be on file with the Graduate Coordinator and exam chair by the proposal due date.

7. Oral Examination. The oral examination will be scheduled within **two - three weeks** of the student's submission of the written proposal. The Examination Committee will administer the examination. Depending on the candidate's discipline, the candidate's advisor may be in attendance as a silent observer during the presentation and subsequent questioning of the candidate. The candidate is expected to demonstrate understanding of all components of the written proposal, as well as general understanding of the field related to the subject of the proposal.

8. Assessment of Performance on the Qualifying Examination. The aims of the examination are to test the student's grasp of fundamental and complex scientific concepts pertaining to the student's chosen field of study, and to assess the student's scientific development and potential as an independent research scientist and communicator. These will be evaluated on the student's performance during the examination in the following areas: researching and developing an independent and viable scientific project; writing and orally presenting and defending this proposed research; and demonstrating an ability to interpret and use the variety of scientific techniques and materials at their disposal.

9. Examination Outcomes. Following completion of the Oral Examination, the student will be excused from the room and the Examination Committee will confer on the outcome of the examination. The candidate's advisor may be asked to evaluate both or either the candidate's performance on the oral examination and the candidate's performance in laboratory research. The Chair will inform the student both verbally and in writing of the Committee's decision. Possible outcomes include Pass/Fail (Bio 9992, see detailed exam outcomes below) or letter grade (Biol 9991).

**Unconditional Pass.** This outcome is reserved for superior examination performances.

**Qualified Pass.** If the student's performance is found to be satisfactory, but deficiencies in the student's background are identified, the student will be given a pass on the exam but will be required to complete coursework specified by the Examination Committee before completion of the Ph.D. Degree.

**Decision Pending.** Frequently, the Examination Committee will find the examination performance incomplete or insufficient in some aspect(s). In this case, the student will be required to prepare and submit additional material and, on occasion, to meet with the Committee to defend this material orally. Oftentimes, these additional objectives serve as guidance to help students in aspects of their performance. A deadline for submission of additional material will be specified by the Examination Committee. Failure on the part of the student to meet this deadline will result in failure of the exam. Following assessment of the additional required material, the Examination Committee will meet to determine if the student has passed or failed the exam. The student will be informed of the Committee's decision in writing.

**Failure.** In the case of failure, the Examination Committee will not reconsider any part of the examination and the student will have to retake the examination based on a completely new research proposal following a minimum interval of six months. Students receiving assistantships to support their graduate education are required to retake the examination by the end of the next Examination Period, unless a leave of absence is taken. Any student who fails the examination twice will be subject to dismissal from the Ph.D. program.

#### **G. Dissertation Proposal and Dissertation Committee.**

A dissertation proposal is required of all students for the doctoral degree.

1. Proposal Procedure. The student must submit a dissertation proposal (approved by the student's dissertation advisor and conforming to the format given below) to the Biology Graduate Coordinator. A Dissertation Committee, of which the dissertation advisor (unless approved) will be Chair, will evaluate the acceptability of the proposal. The Dissertation Committee will consist of at least three members. The Committee will be nominated by the student in consultation with the major professor (who will fill out a **Dissertation Committee Selection Report**), and will be appointed by the Area Program Director and approved by the Chair of the Department. The Dissertation Committee must be formed within one semester of passing the Qualifying Examination, although students are encouraged to form the committee sooner. It is the student's responsibility to secure approval of the Dissertation Proposal from the individual Dissertation Committee members. Before approval, students should schedule a meeting with their committee and present the proposal for feedback. A copy of the proposal bearing the signatures of all Dissertation Committee members must be submitted to the Graduate Coordinator within two semesters of the successful completion of the Qualifying Examination. The student will be allowed to register for Biol 9999 (Dissertation Research) only after an approved proposal has been placed on file in the Biology Department.

2. Proposal Format. The Dissertation Proposal should be considered as just that - a proposal for a plan of future research. It should be formulated early in the course of the research project, and need not be supported by extensive data. It is not a contract. Changes in the direction of the

project after the proposal has been approved are common and even expected, and can be accommodated (see section below).

The dissertation proposal should be clear and concise. The aims and significance of the proposed work must be clearly stated. Sufficient background material must be included to make the significance and the experimental design intelligible to the reader without necessitating referral to outside material. Proposals must be typed and are limited to 10 single-spaced pages of text. The proposal should be prepared according to the following format:

- a. ***Dissertation Proposal Cover Page***
- b. Abstract (1/2 page maximum)
- c. Specific Aims (one page maximum)
- d. Background/Significance (three page maximum)
- e. Preliminary Results (three page maximum)
- f. Experimental Design (six page maximum)
- g. References

Following approval of the proposal, each student is required to meet with his/her Dissertation Committee at least once a year in order to provide the Committee with a report on the progress of the dissertation research. An Annual Meeting is required, and is usually held in the Fall Semester. A short written summary of the student's accomplishments during the past year should be given to the Committee Members before this meeting. Changes in the direction of the research from that which was approved in the Dissertation Proposal should be discussed and approved by the Dissertation Committee at this time. Documentation of the annual meeting between a student and his/her Dissertation Committee must be provided to the Graduate Coordinator by completing the **Report of Annual Meeting between Ph.D. Student and Dissertation Committee** form. Such documentation is necessary for students to subsequently register for research courses (Biol 8800 or 9999).

#### **H. Admission to Candidacy**

To be admitted to candidacy, the student must have established his/her residency, passed the Qualifying Examination, and submitted a Dissertation Proposal approved by the student's Dissertation Committee. Students must be recommended for admission to candidacy within four calendar years of their admission to the doctoral program. Students must submit an **Admission to Candidacy** form. The form may be obtained from the Graduate Coordinator.

Dissertation Research. Students may begin their PhD candidacy by registering for Biol 9999. Students must submit their approved dissertation proposals by the date indicated on the exam schedule. This date will coincide with the registration period in which the student must register for Biol 9999. Failure to submit the proposal and register for research will result in the student being viewed as 'not in good standing' and will result in a decrease in their assistantship.

#### **I. Guidelines for Dissertation Preparation and Oral Presentation.**

Guidelines on how to publish a dissertation are available in the Graduate Office of the College of Arts and Sciences.



- A. Each student must meet with his/her Dissertation Committee **at least** six months before the planned Dissertation Presentation date in order to discuss the dissertation. At that time the committee will decide on the feasibility of the proposed Dissertation Presentation date.
- B. A copy of the entire complete dissertation as approved by the major professor must be submitted by the student to all Dissertation Committee members at least four weeks before the proposed defense date. This allows approximately four weeks for the student to work with his/her Dissertation Committee in order to attain approval from the Dissertation Committee that the dissertation is ready for defense.
- C. After the Dissertation Committee agrees that the dissertation is ready for defense, an approved draft accompanied by a **Request for Defense** form signed by the Dissertation Committee members must be submitted to the Graduate Coordinator at least two weeks before the requested date for the oral presentation.
- D. Upon submission of a completed Request for Defense form, the student will schedule an oral presentation date in consultation with his/her committee members that. The student should suggest a Convener for his/her Dissertation Presentation. The Graduate Coordinator will schedule a room for the presentation and send announcements inviting all members of the Biology Faculty and graduate students to attend at least one week in advance of the oral presentation. An abstract of the dissertation must accompany the announcement. A copy of the dissertation must be available for faculty examination in the Graduate Coordinator's office at least **one week** prior to the presentation.
- E. The Convener of the dissertation presentation will introduce the student to attendees, limit the student to a 45-50 minute summary of the dissertation, and oversee a question-and-answer period. Once the student has responded to all questions from the general audience, the student will meet with members of the Dissertation Committee to answer any remaining questions about the dissertation or the presentation. The Dissertation Committee will then vote to determine whether or not the student has successfully defended the dissertation. The vote of the majority will prevail. The Convener for the dissertation defense will send a completed **Defense of Dissertation Report** form to the Biology Graduate Coordinator. If the student does not defend the dissertation successfully, the Chair of the Department and the Dissertation Committee will schedule a new presentation or provide for other appropriate action.
- F. It is the responsibility of the student to meet the requirements and deadlines of the Graduate Office of the College of Arts and Science concerning submission of the final Dissertation copies.

*All faculty, students, and staff are encouraged to attend each Dissertation presentation. The title, time, and location and abstract of each presentation will be publicized at least one week in advance of the presentation date. A copy of the dissertation will be available for perusal in the Graduate Coordinator's Office.*

## VI. COMPLETION OF NON-THESIS MS DEGREE

PhD students are expected to earn a non-thesis MS degree en-route to the completion of the PhD degree. To do so, students are required to register for Biol 8888 (Non-thesis Master's Paper Preparation) for four semester credit hours during the preparation of their dissertation proposal. Failure to do so will cause a decrease in their assistantship (see Academic Performance on page 3). The dissertation proposal will count as the non-thesis Masters paper. With acceptance of the proposal, students who have completed their PhD coursework will have earned the 40 credit hours necessary for the completion of the non-thesis MS degree. Degree requirements:

- Discipline-specific core courses (8 hours)
- Discipline-specific electives (8 hours)
- Topics, concepts and seminar courses (10 hours) which must include at least six hours of discipline-specific topics and/or concept courses
- Biol 8550 (1 hour) and Biol 6801 (3 hours)
- Biol 8800 (4 hours)
- Biol 6900 (2 hours)
- Biol 8888 (4 hours)

## VII. DEGREE POLICIES

This document applies to students entering the Biology doctoral program at or after the Fall semester of **2012** and supersedes previous documents. Students who entered the program before this time may fulfill either the requirements listed herein or the requirements in effect at the time of their admission. The Department reserves the right to alter the degree requirements by altering this policy document without sending written notification to individual students, although every effort will be made to keep students advised of such changes. Students are strongly encouraged to obtain a current copy of the Biology policy document so that they can keep apprised of current graduation requirements. **It is the sole responsibility of each student to adhere to the policies & procedures outlined in this document.**

## VIII. LEAVE POLICIES

Students do not accrue vacation time and there are no automatic vacation periods, including the semester breaks. Any absence requires approval from the advisor. Absence in excess of two weeks requires approval from the Advisor, Area Program Director and Department Chair. All students must submit in writing the date of their departure and return. If the request is not approved, the advisor and student will be notified. Leave forms are available in the office of the Graduate Coordinator or on the web.

Maternity leave will be handled on a case-by-case basis.

IX. HEALTH INSURANCE

Students who hold any type of graduate assistantship is required to have health insurance.

X. M DECK PARKING

Students can apply for M Deck parking with faculty approval.

XI. WORKING FOR ANOTHER STATE INSTITUTE or AGENCY

While working for Georgia State University, students may not be employed by another institution within the University System of Georgia (USG) or at any other\State of Georgia executive -branch agency. Service as a *consultant* under certain conditions may apply. To do so, you must provide in advance a fully executed "consultant services agreement form" (signed by the Presidents of both USG Institutions), or a "joint staffing letter agreement" signed by appropriate authorities. Except in unusual circumstances, you are not to be employed by, or serve as a consultant to, any agency in the legislative or judicial branch of the State of Georgia.

The Department of Biology prohibits any outside employment if a student is fully supported by the Department.

## **ADDENDUM**

### AEM Ph.D. Program: Preliminary & Qualifying Exams

#### **Preliminary Exam**

After the conclusion of the first Academic year in the AEM Ph.D. program, each student will be required to take and pass a preliminary exam. The preliminary exam will be comprehensive exam that covers those areas fundamental to AEM. The purpose of the qualifying exam is to determine if the candidate has the required background and understanding in microbiology. The preliminary exam consists of a written exam and an oral exam. The written exam is scheduled for 5-6 weeks after the conclusion of the spring semester. The oral exam takes place within two weeks of the written exam.

Three grades are possible on the preliminary exam: unqualified pass, qualified pass, and re-test.

Students who receive an unqualified pass will be permitted to continue on with the Ph.D. studies. Students who receive a qualified pass will be notified of a requirement to undertake a course of action deemed appropriate by the Preliminary Exam Committee to correct those deficiencies. If the student successfully completes the identified course of action they will be permitted to continue on with their Ph.D. studies while they are addressing identified deficiencies. Students who receive the grade of re-test, will be required to re-take the exam the following May. Failure to pass the exam the second time will result in termination from the Ph.D. program.

#### **Qualifying Exam**

It is strongly suggested that student who receive either an unqualified pass or qualified pass on the preliminary exam complete all the requirements of the Qualifying Exam within one year of taking the preliminary exam.

The Qualifying Exam involves the successful preparation of their dissertation proposal and the oral defense of that proposal. The examining committee for the Qualifying Exam will as a minimum include: the student's Ph.D. committee and the Area Program Director for AEM. A minimum of three tenure-track faculty from the biology department and allied faculty are required to constitute a Ph.D. committee. The student's Ph.D. committee must be approved by the Area Program Director.

It will be the responsibility of the Major Professor to inform the Area Program Director that a committee has been formed for a particular student, and the composition of that committee. The composition of that committee and the number of committee members will be based upon the needs and requirements of the particular student. Individuals agreeing to serve on a Ph.D. committee agree to perform their duties in a timely and responsible manner. (In the event of illness or prolonged absence of a committee member, that committee member can be replaced at the recommendation of the Committee Chair. If, however, the Committee Chair (Major Professor) is unable to continue, The Area Program Director for AEM in concert with the other committee members for a student will decide if: a) the thesis work can be continued with another person serving as the Committee Chair, or b) the thesis work must be modified or re-directed to fit with the experience and capabilities of the committee members.

The dissertation proposal will be prepared by the student. This proposal will be reviewed by the student's Ph.D. committee, of which their major professor will be the head. Once the student's major professor is satisfied with the written proposal, the student shall make an oral presentation of this proposal to the Qualifying Exam Committee.

## CMBP QUALIFYING EXAM GUIDELINES

In fulfillment of their PhD requirements, CMBP students will take a qualifying exam in the fall of their third year after completing core course requirements and electives recommended by their committees. Students taking the exam will register for Biol 9991, and receive a letter grade for the exam. Successful completion of the exam requires a grade of B or higher. The student must retake the exam if (s)he scores below a B. The qualifying exam can only be taken twice. A grade of C or lower on the second attempt will automatically result in expulsion from the CMBP PhD program and a terminal MS degree.

The exam consists of two parts, written and oral. For the written portion, the students will write an NIH R01 grant. The following sections describe the exam process and committees.

### **A. Selecting a topic:**

In addition to assessing the candidate's ability to develop an independent research proposal, the purpose of the written component of the exam is to provide a document that can be submitted as a pre-doctoral application to an internal or external funding agency. The topic should be consistent with the student's research interests, and the time spent preparing this document should enhance the students understanding and appreciation for ongoing laboratory research. The content of the proposal should be original, should not duplicate any previous research, and cannot include: (i) Experiments that have already been proposed by the student's advisor. (ii) Experiments which are underway in the advisor's laboratory. (iii) Experiments that have been planned or designed by members of the student's lab research group.

At all stages of the Qualifying Exam, the candidate is encouraged to use multiple sources of written materials and to consult with departmental faculty, especially their advisor. The advisor is expected to actively mentor the student on the written portion of this exam. Such consultations are expected to cover general approaches to writing or methodology, rather than experimental details and other issues pertaining to proposal particulars.

### **B. Preproposal:**

This is a two page document describing the proposal that the student intends to write. Page 1 of this document should provide the background and significance of the proposal, and the overarching hypothesis to be tested, as well as pertinent citations. Page 2 of the pre-proposal should provide the experimental outline (i.e., specific aims that will test hypothesis and experiments that will be performed to achieve the specific aims). The preproposal must be approved before the student can move on to writing the full proposal. The student will submit this pre-proposal for approval to all members of the "written exam committee" via email (see below).

### **c. Full proposal:**

Once the pre-proposal has been approved, the student will have six weeks to complete the full proposal. The full proposal consists of two sections (1) Specific Aims and (2) Research Strategy. The Research Strategy section is further divided into three sections: (a) Significance (b) Innovation (c) Approach. The directions for each section are below, including page limits, font and type size. Strict adherence to these directions is expected. Proposals that exceed page limits will not be considered and the student will receive a C.

**Specific Aims:**

1 page maximum, single spaced, Arial, 11.5 pt font.

The proposal should have 1 to 2 specific aims

The specific Aims page should state concisely the hypothesis to be tested and its significance.

Each aim should be listed and the experiments to achieve the aim should be summarized, as well as their expected outcome(s), including the impact that the results of the proposed research will exert on the research field(s) involved.

**Research Strategy:**

11 page maximum, single spaced, Arial 11.5 pt. font

Organize the Research Strategy as follows. Start each section with the appropriate section heading-Significance, Innovation, Approach. Cite published experimental details in the Research Strategy section and provide the full reference in the Bibliography and References Cited section at the end. Use the "Cell" format in EndNote for the reference section.

**(a) Significance**

- Describe how the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field will be changed if the proposed aims are achieved
- Explain the importance of the problem or critical barrier to progress in the field that the proposed project addresses.
- Explain how the proposed project will improve scientific knowledge, technical capability, and/or clinical practice in one or more broad fields.

**(b) Innovation**

- Explain any refinements, improvements, or new applications of theoretical concepts, approaches or methodologies, instrumentation or interventions.
  - Describe any novel theoretical concepts, approaches or methodologies, instrumentation or intervention(s) to be developed or used, and any advantage over existing methodologies, instrumentation or intervention(s).
- Explain how the application challenges and seeks to shift current research or clinical practice paradigms.

**(c) Approach**

- Describe the overall strategy, methodology, and analyses to be used to accomplish the specific aims of the project. Include how the data will be collected, analyzed, and interpreted
- Discuss potential problems, alternative strategies, and benchmarks for success anticipated to achieve the aims.
- If the project is in the early stages of development, describe any strategy to establish feasibility, and address the management of any high risk aspects of the proposed work

- Point out any procedures, situations, or materials that may be hazardous to personnel and precautions to be exercised.

**The total proposal cannot exceed 12 pages!**

#### **D. Oral exam:**

The student will defend their dissertation in an oral exam, which can be attended by any faculty from Cell Biology and Immunology, including the mentor of the student. If the student's mentor does attend the oral exam, they are not permitted to ask any questions or provide any comments. The student is expected to demonstrate an understanding of **all** components of her/his proposal and an understanding of the fundamental principles of cell biology.

The student should prepare a power point presentation lasting 20-30 minutes without interruption (though there may be interruptions at the exam). The introduction (-first 1/2 of presentation) should provide the background and significance for the project. This portion should contain predominately pictures and diagrams NOT lines of text. The -last 1/2 of the presentation should outline the specific aims and experiments. Here text can be used.

#### **E. Scheduling:**

Since the due dates of pre-proposals, proposals and approvals are known, the Graduate Coordinator will schedule oral CMBP exams at the beginning of the fall semester, before calendars and rooms are booked. Preferably two exams will be scheduled per day in the morning (9-1) or afternoon (1-5).

#### **F. Written Exam Committee:**

Upon student submission of the "Request to Take the Qualifying Examination" form, the Area Program Director will appoint an Examination Committee in consultation with the student advisor. The three person committee will be comprised solely of graduate faculty, and have at a minimum, two full members of CMBP, one of whom will be the chair of the committee. The committee will read and evaluate the entire proposal. Committee members will communicate with the student exclusively through the committee chair.

The student will email the pre-proposal to all committee members. **The chair will ensure that the committee approves the pre-proposal within 10 business days.** Revisions may be requested within that time, and if necessary, the committee may meet with the student at the chair's discretion. If the pre-proposal is not approved within 10 business days, the exam will be deferred until the following year.

Once the pre-proposal is approved, the student will then have six weeks to produce a final proposal. The student will email the final proposal to all committee members. **Within 5 business days after receiving the final proposal, the chair will send out an email to all committee members soliciting a grade for the written proposal.** The chair will average the grades and inform other committee members of the final grade. If there is disagreement (e.g., the grades range from A to C), then the chair will call a short meeting of the committee to resolve the pertinent issues.



**Within 10 business days of final proposal receipt, the committee chair will inform the Graduate Coordinator of the grade for the written portion of the exam.** Students with acceptable proposals (grades of B or higher) will go on to take their previously scheduled oral exams the following week.

If the committee judges the proposal to be unacceptable, the student will receive a C and retake the exam the following year under a new "written exam committee". In the event that the committee confers a grade of C, detailed written evaluations will be supplied to the chair by each committee member, and the chair will pass unadulterated evaluations on to the student. The chair, along with the Area Director will also meet with the student to advise her/him on how the proposal should be altered for success.

#### **G.Oral Exam Committee:**

All full members of CBI can attend the oral exam for each student. The chair of the student's Qualifying Examination Committee will also chair the oral exam. The student's advisor may attend but may not ask questions. The student will prepare a 30 minute presentation. Questions will be allowed during the presentation. As a general rule, each faculty member should expect to ask a minimum of 1-3 questions, keeping in mind that the exam should only last 1.75 hrs including the presentation (i.e., roughly 5-10 minutes of questioning per faculty member). The chair will keep track of the time and questioning to ensure that all faculty equally participate. An examination may extend past 2 hours if the Committee feels it is to the benefit of a student who may not be doing particularly well at first. Extra time may allow the student to relax and provide additional information that makes the difference between an acceptable grade or a grade which mandates the student retake the exam the following semester if it is their first attempt.

When the committee has no further questions, the student will leave the room and the oral exam committee will determine a grade for the oral exam. The final grade will be determined by averaging the written exam and oral exam grades. Student advisor input will only be considered in the event that the student is about to receive a C or lower **on the second exam**. The student will be called back into the room to receive the grade and any comments the faculty wish to share.

## MGB QUALIFYING EXAM GUIDELINES

The MGB Qualifying Examination consists of a written proposal and an oral examination. The Qualifying Examination is generally taken at the end of the student's second year and no later than the end of the third year. Students should obtain approval from their advisor and the program director before initiating the examination process. The examination process is divided into three distinct steps:

**Step 1.** During the second year, each PhD student will develop a topic and direction for a qualifying exam proposal. The student is responsible for choosing the topic from reading the literature and for developing the experimental plan. The advisor will provide general feedback to the student about whether the topic is appropriate and whether the direction and content of the experimental plan are adequate for submission as a Qualifying Exam pre-proposal. The advisor will not develop the plan for the student. The design, development, and the writing the pre-proposal are solely the responsibility of the student. The topic and experimental plan must be independent of any experimental work currently or previously done by the student or the lab they are in. The entire scope of the experimental plan of the Proposal should be thoroughly developed prior to submitting the pre-proposal to the committee even though it is only briefly described in the Specific Aims submitted as part of the pre-proposal. The pre-proposal will consist of the Background and Specific Aims sections of the full proposal (see Step III below). The Committee will acknowledge acceptance of the pre-proposal in most cases. However, the committees may request and approve a revision or suggest termination of the examination due to specific circumstances.

**Step II.** Once the pre-proposal has been approved by the committee, the full Qualifying Exam proposal will be written in its final form. The experimental plan and writing of the full proposal are solely the responsibility of the student. The proposal should be written in the NIH format (10 pages maximum, including any figures, but not including references). Because of the brief format, the choice of the specific information to be included as well as the clarity of the writing is especially important. The full proposal should include the following sections:

- Specific Aims - one page or less  
Typically there will be one or at the most two aims. Each aim should consist of a series of testable hypotheses that are justified by information from the literature. The experimental plans should propose studies to obtain new information about mechanisms. Inclusion of "hunting expeditions" in experimental plans is not appropriate.
- Background - 5 pages maximum recommended  
Only information that provides appropriate background for the proposal and the current knowledge about the topic should be included.
- Research Design and Methods  
the experimental approaches (and reasonable alternative methods) that will be used to achieve the specific aims  
the result that is expected and why  
how this result will be further analyzed and interpreted  
an alternate result(s) that could also be obtained and how this result will be further analyzed and interpreted
- References  
References should be cited in the text and complete references (authors, title, and citation) listed

in a reference list at the end of the proposal

**Step III.** Once the full proposal has been submitted the committee, the student is then required to defend the proposal orally. The purpose of this step is to examine the student's breadth of general as well as specific knowledge related to the written proposal, and to address perceived weaknesses or deficiencies exposed in the experimental plan of the full proposal.

**The Examination Committee will grade the student's performance based on the written proposal and the oral examination.** A grade lower than "B" is considered as a "fail" for the Qualifying Examination. A student who fails this exam can retake it only one additional time. The re-examination must be taken within one year of the first exam.

## APPENDICES

APPENDIX I AREA PROGRAM DIRECTORS

APPENDIX II MINIMUM REQUIRED COURSEWORK FOR EACH CORE DISCIPLINE

APPENDIX III COURSEWORK OFFERINGS

APPENDIX IV LIST OF REQUEST FORMS

# APPENDIX I

## GRADUATE COORDINATOR/ BIOLOGY AREA PROGRAM DIRECTORS

### GRADUATE COORDINATOR:

483 PSC/(404) 413-5314

### AREA PROGRAM DIRECTORS

#### **Applied & Environmental Microbiology:**

Dr. George Pierce  
428 Kell Hall (office), (404)413-5315  
600 Kell Hall (lab), (404)413-5356  
gpierce@gsu.edu

Associate Director: Eric Gilbert

#### **Cellular and Molecular Biology & Physiology:**

Dr. Julia Hilliard  
686 PSC (office), (404)413-6560  
650/680 (lab), (404)413-6564/6565  
jhilliard@gsu.edu

Associate Director: Richard Dix/Ritu Aneja

#### **Molecular Genetics & Biochemistry:**

Dr. Irene Weber  
585 PSC (office), (404)413-5411  
560/583, 565/586 PSC (lab),  
(404)413-5369/67 iweber@gsu.edu

#### **Neurobiology & Behavior:**

Dr. Vincent Rehder  
436A Science Annex (office), (404)413-5412  
466 NSC (lab), (404)413-5345  
vrehder@gsu.edu

## **APPENDIX II**

### **MINIMUM REQUIRED COURSEWORK FOR EACH CORE DISCIPLINE**

Full descriptions of individual courses are given in Appendix III.

Credit will be given only for those courses in which the student receives a grade of B or better

## PROGRAM IN APPLIED AND ENVIRONMENTAL MICROBIOLOGY

### A. Core Courses (select two)

Biol 8010	Cellular Neurobiology (4)
Biol 8020	Integrative Neurobiology (4)
Biol 8220	Molecular Cell Biology (4)
Biol 8248	Advance Cell Physiology (4)
Biol 8410	Advanced Microbiology (4)
Biol 8610	Physiology and Genetics of Prokaryotes (4)
Biol 8620	Eukaryotic Molecular Genetics (4)

### B. Electives (8 hours)

Biol 6045	General Ecology (4)
Biol 6248	Cell Physiology (4)
Biol 6428	Medical Microbiology (4)
Biol 6430	Microbial Diversity and Systematics (4)
Biol 6438	Applied Microbiology (4)
Biol 6451	Aquatic Pollution and Toxicology (3)
Biol 6458	Microbial Ecology and Metabolism (4)
Biol 6480	Principles of Toxicology (3)
Biol 6481	Mycology (4)
Biol 6484	Laboratory Techniques in Applied and Environmental Microbiology (3)
Biol 6580	Microbial Pathogenesis (4)
Biol 6694	Biosafety: Principles & Practice (4)
Biol 8415	Fermentation Microbiology (3)
Biol 8416	Bacterial & Archaeal Systems (3)
Biol 8620	Eukaryotic Molecular Genetics (4)
Biol 8910	Topics in Biology (4)*
Chem 6610	Advanced Biochemistry (3)

### C. Concepts/Topics/Seminar (10 hours)

Biol 8510	Concepts in Microbiology (2)***
Biol 8700	Seminar (1)
Biol 8900	Topics in Microbiology (1)
Biol 8970	Topics in Molecular Biological Sciences (1)
Biol 8980	Topics in Applied and Environmental Microbiology (1)***

### D. Introduction to Graduate Studies (4 Hours)

Biol 8550	Introduction to Graduate Studies (2)**
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Biol 9992 Doctoral Research Proposal (2)

**Proficiency in Biochemistry.** Biochemistry proficiency can be demonstrated by completion of Chem 6600 with a B or better. Students may petition for a waiver of the biochemistry requirement if they have made a B or better in an undergraduate course deemed by the Graduate Committee to be equivalent to Chem 6600. Substitution of proficiency (demonstrated by examination or by receipt of a B or better in coursework) in one or more equivalent discipline-related subjects from chemistry, physics, or psychology appropriate to the student's program of study will be considered on a case-by-case basis and requires the prior written approval of the Biology Graduate Committee.

. Requires prior Area Advisor approval

.. To be taken during the first semester of residence

.. *'At least 6 hours of discipline-specific Topics and/or Concepts courses must be taken*



## PROGRAM IN CELLULAR and MOLECULAR BIOLOGY & PHYSIOLOGY

### A. Core Courses (select two)

Biol 8010	Cellular Neurobiology (4)
Biol 8020	Integrative Neurobiology (4)
Biol 8220	Molecular Cell Biology (4)
Biol 8248	Advance Cell Physiology (4)
Biol 8278	Molecular Immunology (4)
Biol 8410	Advanced Microbiology (4)
Biol 8610	Physiology and Genetics of Prokaryotes (4)
Biol 8620	Eukaryotic Molecular Genetics (4)

### B. Electives (8 hours)

Biol 6074	Developmental Biology (4)
Biol 6240	Endocrinology (4)
Biol 6246	Advanced Animal Physiology (4)
Biol 6458	Microbial Ecology and Metabolism (4)
Biol 6500	Human Genetics (4)
Biol 6744	Biostatistics (3)
Biol 6930	Topics in Biology (4)*
Biol 8010	Cellular Neurobiology (4)
Biol 8020	Integrative Neurobiology (4)
Biol 8278	Molecular Immunology (4)
Biol 8610	Physiology and Genetics of Prokaryotes (4)
Biol 8620	Eukaryotic Molecular Genetics (4)
Biol 8637	Nucleic Acid Structure and Function (3)
Biol 8696	Advanced Biotechniques Lab (4)
Biol 8675	Molecular Virology (4)
Biol 8910	Topics in Biology (4)**
Chem 6610	Advanced Biochemistry (3)
Chem 6850	Bioanalytical Chemistry (3)
Chem 8360	Protein Structure and Function (3)
Chem 8510	Biophysical Chemistry (3)

### C. Topics/Seminar (10 hours)

Biol 8310	Concepts in Cell Biology and Physiology (2)'''
Biol 8710	Concepts in Molecular Genetics (2)''*

Biol 8700	Seminar (1)
Biol 8900	Topics in Microbiology (1)
Biol 8960	Topics in Cell Physiology and Biochemistry (1)***
Biol 8970	Topics in Molecular Biological Sciences (1)

**D. Introduction to Graduate Studies (7 hours)**

Biol 8550	Introduction to Graduate Studies (2)
Biol 6801	Survival Skills in Academia (Ph.D. exam preparation) (3)
Biol 9991	Doctoral Research Proposal (2)

- E. Proficiency in Biochemistry.** Biochemistry proficiency can be demonstrated by completion of Chem 6600 with a B or better. Students may petition for a waiver of the biochemistry requirement if they have made a B or better in an undergraduate course deemed by the Graduate Committee to be equivalent to Chem 6600. Substitution of proficiency (demonstrated by examination or by receipt of a B or better in coursework) in one or more equivalent discipline-related subjects from chemistry, physics, or psychology appropriate to the student's program of study will be considered on a case-by-case basis and requires the prior written approval of the Biology Graduate Committee.

<sup>1</sup>Requires prior Area Advisor approval

<sup>2</sup>To be taken during the first semester of residence

<sup>3</sup>*"At least 6 hours of discipline-specific Topics and/or Concepts courses must be taken"*

## PROGRAM IN MOLECULAR GENETICS & BIOCHEMISTRY

### A. Core Courses (select two)

Biol 8010	Cellular Neurobiology (4)
Biol 8020	Integrative Neurobiology (4)
Biol 8220	Molecular Cell Biology (4)
Biol 8248	Advance Cell Physiology (4)
Biol 8278	Molecular Immunology (4)
Biol 8410	Advanced Microbiology (4)
Biol 8610	Physiology and Genetics of Prokaryotes (4)
Biol 8620	Eukaryotic Molecular Genetics (4)

### B. Electives (8 hours)

Biol 6074	Developmental Biology (4)
Biol 6248	Cell Physiology (4)
Biol 6500	Human Genetics (4)
Biol 6564	Advanced Genetics (4)
Biol 6580	Microbial Pathogenesis (4)
Biol 6640	Fundamentals of Bio-Informatics (4)
Biol 6800	Advanced Cell Biology (4)
Biol 8010	Cellular Neurobiology (4)
Biol 8020	Integrative Neurobiology (4)
Biol 8220	Molecular Cell Biology (4)
Biol 8278	Molecular Immunology (4)
Biol 8360	Protein Structure and Function (3)
Biol 8410	Advanced Microbiology (4)
Biol 8630	Bio-Informatics (4)
Biol 8637	Nucleic Acid Structure and Function (3)
Biol 8696	Advanced Biotechniques Lab (4)
Biol 8675	Molecular Virology (4)
Biol 8910	Topics in Biology (4)*
Chem 6610	Advanced Biochemistry (3)
Chem 8360	Protein Structure and Function (3)

### C. Topics/Seminar (10 hours)

Biol 8700	Seminar (1)
Biol 8710	Concepts in Molecular Genetics (2)**

Biol 8900	Topics in Microbiology (1)
Biol 8960	Topics in Cell Physiology and Biochemistry (1)
Biol 8970	Topics in Molecular Biological Sciences (1)**

**D. Introduction to Graduate Studies (7 hours)**

Biol 8550	Introduction to Graduate Studies (2)*
Biol 6801	Survival Skills in Academia (Ph.D. exam preparation) (3)
Biol 9991	Doctoral Research Proposal (2)

**E. Proficiency in Biochemistry.** Biochemistry proficiency can be demonstrated by completion of Chem 6600 with a B or better. Students may petition for a waiver of the biochemistry requirement if they have made a B or better in an undergraduate course deemed by the Graduate Committee to be equivalent to Chem 6600. Substitution of proficiency (demonstrated by examination or by receipt of a B or better in coursework) in one or more equivalent discipline-related subjects from chemistry, physics, or psychology appropriate to the student's program of study will be considered on a case-by-case basis and requires the prior written approval of the Biology Graduate Committee.

\*Requires prior approval from the Area MGB Director

"To be taken during the first semester of residence

" At least 6 hours of discipline-specific Topics and/or Concepts courses must be taken

**PROGRAM IN MOLECULAR GENETICS & BIOCHEMISTRY WITH INTERDISCIPLINARY  
SPECIALIZATION IN BIO-INFORMATICS**

**A. Core Courses (select two)**

Biol 8010	Cellular Neurobiology (4)
Biol 8020	Integrative Neurobiology (4)
Biol 8220	Molecular Cell Biology (4)
Biol 8248	Advance Cell Physiology (4)
Biol 8278	Molecular Immunology (4)
Biol 8410	Advanced Microbiology (4)
Biol 8610	Physiology and Genetics of Prokaryotes (4)
Biol 8620	Eukaryotic Molecular Genetics (4)

**8. Electives (8 hours)**

Biol 6074	Developmental Biology (4)
Biol 6248	Cell Physiology (4)
Biol 6500	Human Genetics (4)
Biol 6564	Advanced Genetics (4)
Biol 6580	Microbial Pathogenesis (4)
Biol 6640	Fundamentals of Bio-Informatics (4)
Biol 6800	Advanced Cell Biology (4)
Biol 8010	Cellular Neurobiology (4)
Biol 8020	Integrative Neurobiology (4)
Biol 8220	Molecular Cell Biology (4)
Biol 8278	Molecular Immunology (4)
Biol 8360	Protein Structure and Function (3)
Biol 8410	Advanced Microbiology (4)
Biol 8630	Bio-Informatics (4)
Biol 8637	Nucleic Acid Structure and Function (3)
Biol 8675	Molecular Virology (4)
Biol 8696	Advanced Biotechniques Lab (4)
Biol 8910	Topics in Biology (4)*
Chem 6610	Advanced Biochemistry (3)
Chem 8360	Protein Structure and Function (3)

**C. Topics/Seminar (10 hours)**

Biol 8700	Seminar (1)
Biol 8710	Concepts in Molecular Genetics (2)**
Biol 8900	Topics in Microbiology (1)
Biol 8960	Topics in Cell Physiology and Biochemistry (1)
Biol 8970	Topics in Molecular Biological Sciences (1)***

#### **D. Introduction to Graduate Studies (7 hours)**

- Biol 8550 Introduction to Graduate Studies (2)"
- Biol 6801 Survival Skills in Academia (Ph.D. exam preparation) (3)
- Biol 9991 Doctoral Research Proposal (2)

**E. Proficiency in Biochemistry.** Biochemistry proficiency can be demonstrated by completion of Chem 6600 with a B or better. Students may petition for a waiver of the biochemistry requirement if they have made a B or better in an undergraduate course deemed by the Graduate Committee to be equivalent to Chem 6600. Substitution of proficiency (demonstrated by examination or by receipt of a B or better in coursework) in one or more equivalent discipline-related subjects from chemistry, physics, or psychology appropriate to the student's program of study will be considered on a case-by-case basis and requires the prior written approval of the Biology Graduate Committee.

#### **F. Departmental Requirements (4 hours; may be used to meet Elective requirement)**

- Biol 6640 Fundamentals of Bio-Informatics (4)

#### **G. Interdisciplinary Requirements (12 hours)**

Courses in Bio-Informatics offered by the Mathematics and Statistics and/or Computer Science Departments (specified prerequisites may be used to satisfy the 12 hour requirement). In Consultation with the Major advisor, the student will submit a course plan to meet these requirements for approval by the MGB Graduate Director. Interdisciplinary courses include:

- Math 6744 Biostatistics (3)
- Math 6548 Methods of Variance and Analysis of Regression (3)  
(Prerequisite: Math 6544 or Biol 6744 (Biostatistics))
- Stat 8050 Statistics for Bioinformatics (3)  
(Prerequisite: Math 6544 or Biol 6744 (Biostatistics))
- Stat 8540 Advanced Methods for Biostatistics (3)  
(Prerequisite: Math 6544 or Biol 6744 (Biostatistics))
- CSc 6310 Parallel and Distributed Computing (4)  
(Prerequisite: CSc 7350 (Java)(3) and CSc 7351 (C++)(3))
- CSc 6730 Scientific Visualization (4)  
(Prerequisite: CSc 7350 (Java (3) and CSc 7351 (C++)(3))
- CSc 6350 Software Engineering (4)  
(Prerequisite: CSc 6999 (Data Structure)(3), CSc 7350 and CSc 7351 are prerequisites for CSc 6999)
- CSc 6710 Database Systems (4)  
(Prerequisite: CSc 6999 (Data Structure)(3), CSc 7350 and CSc 7351 are prerequisites for CSc 6999)
- CSc 8710 Deductive Databases and Logic Programming (4)

**H. Dissertation Committee/Dissertation Requirements**

At least one member of the student's dissertation committee must be from the Mathematics and Statistics or Computer Science Department faculty who is a member of the departments Bio-Informatics program. The student's dissertation research must contain a significant bio-informatics research component (decisions on fulfilling this requirement will be made by the student's dissertation committee).

- Requires prior approval from the Area MGB Director
- .. To be taken during the first semester of residence
- At least 6 hours of discipline-specific Topics and/or Concepts courses must be taken

## **PROGRAM IN NEUROBIOLOGY & BEHAVIOR**

### **A. Core Courses (select two)**

- Biol 8010 Cellular Neurobiology (4)
- Biol 8020 Integrative Neurobiology (4)
- Biol 8220 Molecular Cell Biology (4)
- Biol 8248 Advance Cell Physiology (4)
- Biol 8410 Advanced Microbiology (4)
- Biol 8610 Physiology and Genetics of Prokaryotes (4)
- Biol 8620 Eukaryotic Molecular Genetics (4)

### **B. Electives (8 hours)**

- Biol 6074 Developmental Biology (4)
- Biol 6094 Developmental Neurobiology (4)
- Biol 6114 Neural Mechanisms of Regulatory Behavior (4)
- Biol 6116 Primate Behavior: Field and Laboratory (4)
- Biol 6180 Neurobiology Laboratory (4)
- Biol 6240 Endocrinology (4)
- Biol 6241 Hormones and Behavior (4)
- Biol 6246 Advanced Animal Physiology (4)
- Biol 6248 Cell Physiology (4)
- Biol 6500 Human Genetics (4)
- Biol 6564 Advanced Genetics (4)
- Biol 6680 Biological Imaging
- Biol 6744 Biostatistics (3)
- Biol 8040 Functional Human Neuroanatomy (3)
- Biol 8060 Behavioral Neuroscience (3)
- Biol 8220 Molecular Cell Biology (4)
- Biol 8278 Molecular Immunology (4)
- Biol 8610 Physiology and Genetics of Prokaryotes (4)
- Biol 8620 Eukaryotic Molecular Genetics (4)
- Biol 8696 Advanced Biotechniques Lab (4)
- Biol 8910 Topics in Biology (4)\*
- Chem 6610 Advanced Biochemistry (3)
- Psych 6130 Sensation and Perception (3)



**C. Topics/Seminar (10 hours)**

- Biol8110 Concepts in Neurobiology (2)\*\*\*
- Biol8700 Seminar (1)
- Biol8950 Topics in Behavior and Neurobiology (1)
- Biol8960 Topics in Cell Physiology and Biochemistry (1)\*\*\*
- Biol8970 Topics in Molecular Biological Sciences (1)

**D. Introduction to Graduate Studies (7 hours)**

- Biol 8550 Introduction to Graduate Studies (2)\*\*
- Biol6801 Survival Skills in Academia (Ph.D. exam preparation) (3)
- Biol9992 Doctoral Research Proposal (2)

**E. Proficiency in Biochemistry.** Students are required to have proficiency in upper division. Biochemistry, Biophysics, Evolution, Cell Biology, Neurophysiology or Computational Biology. Proficiency can be demonstrated by completion of a course approved by the Area Program Director in one of those disciplines with a letter grade of at least a 'B'. Alternatively, students may petition the Area Program Director to waive this requirement based on receiving a letter grade of at least a 'B' in an undergraduate course considered comparable to a GSU -offered course in one of these disciplines.

'Requires prior Area Advisor approval

"To be taken during the first semester offered

""At least 6 hours of discipline-specific Topics and/or Concepts courses must be taken

## APPENDIX III.

### *Ph.D. PROGRAM*

#### COURSEWORK OFFERINGS

##### Course Descriptions

*NOTE. Course credit hours are shown in parentheses immediately following the course title.*

**Biol 6074. Developmental Biology. (4)** Four lectures hours a week. Prerequisites: Biol 3840 and 3900. Introduction to developmental biology emphasizing cellular, genetic, and molecular mechanisms of development.

**Biol 6102. Neurobiology. (4)** Four lecture hours a week. Prerequisite: Biol 3800 and 3840 or equivalent. Comparative analysis of neuroscience, including cellular and molecular systems and behavioral approaches.

**Biol 6114. Neural Mechanisms of Regulatory Behavior. (4)** (Same as Psyc 6057.) Four lecture hours a week. Prerequisites: Biol 3800 and 3840, or equivalents. Social behavior and communication. Topics include reproductive behavior, aggression and brain-behavior relationships in language and cognition.

**Biol 6116K. Primate Behavior: Field and Laboratory. (4)** (Same as Psyc 6116.) Three lecture and two laboratory hours a week. Prerequisites: Biol 3840 or Psyc 4110 or equivalent. Non-human and human primate origin of cognition language, mythology, rituals, tool use, nonverbal expressions, symbolism, sexuality and aggression.

**Biol 6180. Neurobiology Laboratory. (4)** Two lecture and six laboratory hours a week. Prerequisite: Biol 4102 or concurrently. Laboratory techniques in neuroscience including intra- and extracellular electrophysiology, computational methods, neuroanatomy, immunocytochemistry, and neuroethology.

**Biol 6240. Endocrinology. (4)** Four lecture hours a week. Prerequisites: Biol 3840 and Chem 6600 or equivalents. Basic biochemistry and physiology of the endocrine system including synthesis and secretion of steroid and protein hormones, mechanisms of hormone activity and endocrinology of reproduction.

**Biol 6241. Hormones and Behavior. (4)** Four lecture hours a week. Prerequisites: Biol 3840. Interaction of nervous and endocrine systems in the control of animal behavior, including humans, with Emphasis on the mechanisms that adapt behavior to the changing physical and social environments.

**Biol 6246. Advanced Animal Physiology. (4)** Four lecture hours a week. Prerequisite: Biol 3840 or equivalent. Physiological systems of animals with emphasis on the skeletal, muscular, circulatory, respiratory, gastro-intestinal, and renal systems. Human physiology will be emphasized.

**Biol 6248. Cell Physiology. (4)** Four lecture hours a week. Prerequisites: Biol 3820, 3840, 3880, 3900, Chem 3410, Chem 4600 is recommended.  
Mechanism of cell and organ function at the molecular level.

**Biol 6428. Medical Microbiology. (4)** Three lectures and three laboratory hours a week. Prerequisites: Biol 3880 and 3890, or equivalents. ·  
Important human pathogenic microorganisms, including characteristics, host-parasite relationships, epidemiology, and immunity.

**Biol 6430. Microbial Diversity and Systematics. (4)** Three lectures and three laboratory hours a week.  
Prerequisites: Biol 3880 and 3890, or equivalents.  
Diversity and systematics of selected groups of bacteria and yeasts.

**Biol 6438. Applied Microbiology. (4)** Four lecture hours a week. Prerequisites: Biol 3880 and 3890, or equivalents.  
Microbiology of industrial processes including. Quality control, fermentations, biotransformations, strain selection and maintenance.

**Biol 6451. Aquatic Pollution and Toxicology. (3)** Three lecture hours a week. Prerequisite: inorganic and organic chemistry recommended.  
Comprehensive introduction to water pollution (including relevant methods and techniques) and its relationship to public health.

**Biol 6458. Microbial Ecology and Metabolism. (4)** Four lecture hours a week. Prerequisites: Bio 3880 and 3890 or equivalents.  
Microbial communities and the interrelationships of microorganisms in their environment. Particular emphasis on metabolic activities, and their measurement and application to environmental problems (bioremediation).

**Biol 6481. Mycology. (4)** (Formerly Bio 681.) Four lecture hours a week. Prerequisites: Biol 3880 and 3890 or equivalents.  
Ecology, physiology, and systematics of micro-fungi, particularly organisms of industrial and economic importance

**Biol 6484. Laboratory Techniques in Applied and Environmental Microbiology. (3)** One lecture and four laboratory hours a week. Prerequisites: Biol 3880 and 3890, or equivalents.  
Techniques and procedures for isolation, characterization and identification of microorganisms of practical significance; model ecosystems and biofilms, sampling and enumeration of microorganisms, metabolism and analysis of microbial growth.

**Biol 6500. Human Genetics. (4)** Four lecture hours a week. Prerequisite: Biol 3900.  
Principles of human heredity with emphasis on the molecular basis of heredity, detection and treatment of genetic diseases and genetic counseling.

**Biol 6564. Advanced Genetics. (4)** Four lecture hours a week. Prerequisite: Biol 3900.

Advanced concepts and techniques of prokaryotic and eukaryotic genetics including gene mapping, recombinant DNA technology, molecular techniques for genetic analysis.

**Biol 6580. Microbial Pathogenesis. (4)** Four lecture hours a week. Prerequisite: Biol 3880 and 3890, or equivalents.

This course integrates material from pathogenic microbiology, molecular biology and immunology into an overview of microbe-host interactions bacterial-host interaction focusing on molecular and genetic approaches.

**Biol 6694. Biosafety: Principles & Practice. (4)** Four lecture hours a week. Prerequisite: Biol 3800 or consent of the instructor.

The discussion of pathogenic agents and their associated occupational and public health risks. Topics include emerging biosafety issues such as bioterrorism, human gene therapy, and federal and state regulations guiding use of pathogenic organisms.

**Biol 6696. Laboratory in Molecular Biological Techniques. (4)** One lecture and six laboratory hours a week. Prerequisites: Biol 3800, 3900 and Chem 4600.

Isolation and characterization of nucleic acids and proteins. Topics include molecular cloning; isolation, characterization and sequence analysis of chromosomal and plasmid DNA; PCR mediated gene amplification and protein purification.

**Biol 6744. Biostatistics. (3)** (Same as Math 6544.) Three lecture hours a week. Prerequisites: Math 2211, Biol 1107K and 1108K or equivalents.

Principles and methods of statistics as applied to biology and medicine.

**Biol 6801. Survival Skills In Academia. (3)** Guidance and direction for graduate students on how to Accomplish many of the day-to-day tasks encountered by researchers and instructors throughout their careers in academia. Topics covered include how to write and publish scientific papers, grantspersonship, scientific ethics, posters and oral presentations, mentoring and job interviewing.

**Biol 6900. Direct Laboratory Study. (2)**

**Biol 6930. Topics in Biology. (4)** Four lecture hours a week. May be repeated for credit if topics are different. Prerequisite: consent of instructor.

Detailed examination of a selected area in biological science

**Biol 7802. Instructional Methods. (3)** Two laboratory hours a week and discussion sections with laboratory supervisors for the review of laboratory progress and problems (one hour a week).

Prerequisite: consent of instructor.

Principles of undergraduate laboratory instruction, including instructional theory, laboratory policies and academic honesty. A laboratory apprenticeship is required.

**Biol 8010. Neurobiology I: Cellular Neurobiology. (4)** (Same as Psych 8616.) Four lecture hours a week. Prerequisites: Biol 3800 and 3840, or equivalents.

The unique cellular and molecular properties of neurons and how these properties enable neurons to perform their computational tasks. Topics include neuronal excitability, synaptic communication, sensory transduction and neural development.

**Biol 8020. Neurobiology II: Integrative Neurobiology. (4)** (Same as Psyc 8617.) Four lecture hours a week. Prerequisite: Biol 8010 or Psyc 8616.

How neurons are organized into neural systems that control behavior. Topics include sensory integration, central pattern generators, control and motor systems, neuroendocrine systems and neural modulation, and the neural basis of learning and cognition.

**Biol 8040. Functional Human Neuroanatomy. (3)** (Same as Psyc 8615.) Two lecture and two laboratory hours a week. Prerequisite: Biol 3840 or Psyc 8610, or equivalent, or consent of instructor.

In-depth study of the neuroanatomy and function of the human central nervous system. Considers neuroanatomical techniques used to study the brain, neuroanatomical basis for the control of sensory and motor systems, as well as cortical, autonomic nervous system and limbic system anatomy, and function. Both normal brain anatomy and pathologies are covered.

**Biol 8060. Behavioral Neuroscience. (3)** (Same as Psyc 8610.) Three lecture hours a week.

Prerequisite: Biol 3840 or Psyc 4110.

Analysis of functional neural systems in the regulation of behavior, emphasizing the analysis of limbic, hypothalamic and reticular-cortical mechanisms in behavior.

**Biol 8110. Concepts in Neurobiology. (2)** Two lecture hours a week. Prerequisite: Consent of instructor.

Lectures dealing with contemporary topics in neurobiology.

**Biol 8220. Molecular Cell Biology. (4)** Four lecture hours a week. Prerequisite: Biol 6480 or consent of instructor.

Current concepts in cell biology. The structure and function of the various cellular components and processes will be examined on a molecular, cellular and multicellular level.

**Biol 8278. Molecular Immunology. (4)** Four lecture hours a week. Prerequisites: Biol 3800, 3880, 3900, and Chem 3410, or equivalents.

Important concepts of modern immunology presented in an experimental context. Topics include structure and function of antibodies, genetics of immunoglobulin and TCR expression, the MHC, antigen processing and presentation, T and B cell activation, cytokines, and regulation.

**Biol 8310. Concepts in Cell Biology and Physiology. (2)** Two lecture hours a week. Prerequisite:

Consent of instructor.

Lectures dealing with contemporary topics in cell biology and physiology.

**Biol 8410. Advanced Microbiology. (4)** Four lecture hours a week. Prerequisite: Biol 3880.

In depth study of the organismal aspects of microbiology with particular emphasis on metabolic functions in eukaryotic microorganisms.

**Biol 8415. Fermentation Microbiology. (3)** Four lecture hours a week. Prerequisite: Biol 3880 or

equivalent.

Familiarizes the advanced student with the issues, problems, fundamentals, and approaches to the scale up of microbiological processes. Selected team/group demonstrations and tutorials will be conducted with the students to illustrate and reinforce the concepts and examples provided in the lectures.

**Biol 8416. Bacterial & Archaeal Systems. (3)** Four lecture hours a week. Prerequisite: Biol 3880 or equivalent.

The rationale and approach to microbial systematics and the application of practical taxonomy as related to bacteria and archaea.

**Biol 8510. Concepts in Microbiology. (2)** Two lecture hours a week. Prerequisite: Consent of instructor. Lectures dealing with contemporary topics in microbiology.

**Biol 8550. Introduction to Graduate Studies. (2)** Two lecture hours a week.

Analysis, discussion and review of basic skills, techniques, and requirements for compliance in biology, organizational requirements, and ethics in biology.

**Biol 8610. Physiology and Genetics of Prokaryotes. (4)** Four lecture hours a week. Prerequisites: Chem 4600 or equivalent, and consent of instructor. Physiology and molecular biology of the microbial world, with an emphasis on a molecular genetic approach to an understanding of the bacterial cell.

Topics include macromolecular synthesis, molecular and cell to cell interactions, and recombinant DNA techniques, together with microbial metabolism and the regulation of gene expression.

**Biol 8620. Eukaryotic Molecular Genetics. (4)** Four lecture hours a week. Prerequisites: Biol 8610 or consent of instructor; Chem 4600 or equivalent. Principles of cell biology as relevant to eukaryotic molecular genetics, and chromosome structure and gene regulation. Advanced topics include gene manipulation in higher plants and animals, gene therapy, and genome sequencing.

**Biol 8637. Nucleic Acid Structure and Function. (3)** (Formerly Bio 837.) (Same as Chem 8370.) Three lecture hours a week. Prerequisite: Chem 6610 or consent of instructor. Topics include the structure of nucleic acids, mechanism and control of DNA and RNA structure, and interaction of proteins and drugs with nucleic acids.

**Biol 8675. Molecular Virology. (4)** Four lecture hours a week. Prerequisites: Biol 3880, 3890, 4575, and Chem 4600. Molecular biology of viruses, their replication and genetics, and interaction of viruses and the host cell.

**Biol 8696. Advanced Biotechniques Laboratory. (4)** One lecture and six laboratory hours a week. Prerequisites: Biol 3800, 3900 and Chem 4600. The primary objective of this course is to introduce students the advanced techniques and instrumentation applied in the molecular biology research. To achieve this goal, students will have hands-on experiences by performing wet lab practices employing various molecular techniques. Lectures will be provided to cover the scientific background behind these techniques as well as other advanced techniques.

**Biol 8700. Biology Seminar. (1)** (No more than one hour a semester.)  
Current research topics in biology.

**Biol 8710. Concepts in Molecular Genetics. (2)** Two lecture hours a week. Prerequisite: consent of instructor.  
Lectures dealing with contemporary topics in molecular genetics.

**Biol 8800. Research. (1-20)** Prerequisite: consent of instructor.

**Biol 8900. Topics in Microbiology. (1)** (Formerly Bio 890.) (Repeatable course.)

**Biol 8910. Topics in Biology. (4)**

**Biol 8940. Topics in Physiology. (1)** (Formerly Bio 894.) (Repeatable course.)

**Biol 8950. Topics in Behavior and Neurobiology. (1)** (Formerly Bio 895.) (Repeatable course.)

**Biol 8960. Topics in Cell Physiology and Biochemistry. (1)** (Formerly Bio 896.) (Repeatable course.)

**Biol 8970. Topics in Molecular Biological Sciences. (1)** (Formerly Bio 897.) (Same as Chem 8970.) (Repeatable course.)

**Biol 8980. Topics in Applied and Environmental Microbiology. (1)** (Formerly Bio 898.) (Repeatable course.)

**Biol 9991. Doctoral Research Proposal.**

**Biol 9992. Doctoral Research Proposal.**

**Biol 9999. Doctoral Dissertation Research. (1-20)** Prerequisite: consent of instructor.

# APPENDIX IV

## LIST OF REQUEST FORMS

All of the following forms are available in the Graduate Coordinator's Office located in the Biology Department, Room 483 in PSC or on the web (Graduate forms).

**FORM A:** REQUEST TO TAKE PH.D. QUALIFYING EXAMINATION

**FORM B:** DISSERTATION COMMITTEE SELECTION REPORT

**FORM C:** PH.D. DISSERTATION PROPOSAL COVER PAGE

**FORM D:** REPORT OF ANNUAL MEETING BETWEEN PH.D. STUDENT AND DISSERTATION COMMITTEE

**FORM E:** APPLICATION FOR ADMISSION TO CANDIDACY

**FORM F:** REQUEST FOR SCHEDULING OF DISSERTATION PRESENTATION

**FORM G:** DEFENSE OF DISSERTATION REPORT